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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/651,849	08/31/2000	Sarath Kumar	16-11-30-5	4424

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EXAMINER

D AGOSTA, STEPHEN M

ART UNIT	PAPER NUMBER
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2683

DATE MAILED: 05/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/651,849

Applicant(s)

KUMAR ET AL.

Examiner

Stephen M. D'Agosta

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☒ Claim(s) 29 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_.
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

**Claim 29** objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. **Claim 29 and claim 27 contain the exact same claim language AND both refer back to the same independent claim.**

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-28** rejected under 35 U.S.C. 103(a) as being unpatentable over Ling et al. US Patent 6,377,607 in view of Sampath & Kumar VTC Conference 9/1999, Jalloul et al. US Patent 6,192,040 and Holtzman US Patent 6,393,257 (hereafter Ling, Sampath, Jalloul and Holtzman).

As per **claim 1**, Ling teaches a wireless receiver comprising:

A receiver for receiving a wireless signal (C1, L8-13)

A demodulator for generating a log-likelihood ratio (C2, L50-67 to C3, L1-52) as a function of a scale factor wherein the scale factor is a function of a ratio (abstract, teaches scaling LLR ratio scaling factor as does C4, L37-67 teaches a LLR scaling factor using SIR's) **but is silent on** between energy components of the wireless signal.

Ling does teach computing energy per data symbol ( $\bar{E}_s$ : C10, L59-60) and pilot symbol energy ( $E_p$ : C14, L14-15).

Sampath teaches  $\beta$  which can be shown to be a ratio of  $E_p/E_d$  by rearranging the equation on page 2, top of left column (eg.  $E_p = \beta E_d$ ).

Jalloul teaches the calculation of a "pilot to data power ratio" (C5, L26-37).

Holtzman teaches calculating a ratio between the energy of the pilot symbols and the traffic/data channel's energy (C9, L44-46).

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that the scale factor is a ratio between energy components, to provide means for correct demodulation (using LLR) based upon a comparison of the energy components of the wireless signal.

As per **claim 2**, Ling teaches claim 1 further comprising a processor for determining the scale factor (figure 5 and C8, L55-61 teaches a circuit/processor for computing S/I and LLR).

As per **claim 3**, Ling teaches claim 2 wherein the scale factor is determined independently of relative strengths and number of multipaths in the received wireless signal (C4, L37-67 teaches computing the LLR scaling factor which is independent of relative strengths and number of multipaths since the equation does not show variables for these components).

As per **claim 4**, Ling teaches claim 1 further comprising a processor for determining scale factor as a function of ratio between energy components of the wireless signal (see claim 1), a noise variance in received data symbols (C4, L22-27) **but is silent on** a noise variance in received pilot symbols.

Holtzman teaches calculation of the energy per symbol of the traffic channel and determines the estimate of the noise variance (C9, L60-63). Holtzman also teaches (in step 608 of figure 6) the signal and noise estimator estimates the ratio of the energy of the pilot versus the energy of the symbol AND (in step 610)  $E_p/E_s$  is calculated (C9, L64-67 to C10, L1-7). Holtzman goes on to disclose that other functions and methods may be performed by the signal/noise estimator and control process (C10, L8-16) which reads on calculating a noise variance in received pilot symbols.

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that noise variance in received pilot symbols is used, to provide means for incorporating the pilot symbol noise variance into the LLR function.

As per **claim 5**, Ling teaches claim 4 wherein the scale factor is determined independently of relative strengths and number of multipaths in the received wireless signal (C4, L37-67 teaches computing the LLR scaling factor which is independent of relative strengths and number of multipaths since the equation does not show variables for these components).

As per **claim 6**, Ling teaches claim 1 and a lookup table (figure 8, #140) **but is silent on** comprising memory for lookup table storing the scale factor.

Holtzman teaches using a stored data curve (or plot) which reads on a lookup table (C11, L50-56).

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that a lookup table is used for storing scale factor, to provide quicker means of finding the correct/optimal scale factor (ie. lookup versus finding data on a data curve/plot).

As per **claim 7**, Ling teaches claim 6 wherein the function is a square root of the ration between the energy components of the signal (C14, L4-18 teaches a square root function of  $E_s/E_p$  and "k" is interpreted to be the scale factor of the LLR).

As per **claim 8**, Ling teaches claim 1 **but is silent on** wherein the received signal comprises pilot symbols and data symbols and the ratio between energy components is a ratio between transmitted energy per pilot symbol to a transmitted energy per data symbol.

Ling does teach computing energy per data symbol ( $\bar{E}_s$ : C10, L59-60) and pilot symbol energy ( $E_p$ : C14, L14-15).

Sampath and Kumar teach  $\beta$  which can be shown to be a ratio of  $E_p/E_d$  by rearranging the equation on page 2 (eg.  $E_p = \beta E_d$ ).

Jalloul teaches the calculation of a "pilot to data power ratio" (C5, L26-37).

Holtzman teaches calculating a ratio between the energy of the pilot symbols and the traffic/data channel's energy (C9, L44-46).

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that the scale factor is a ratio between energy components, to provide means for correct demodulation (using LLR) based upon a comparison of the energy components of the wireless signal.

As per **claim 9**, Ling teaches claim 1 wherein the receiver comprises a demultiplexer for providing a data signal (eg. data), control signal (eg. pilot) and the ratio (figures 2 and 4, shows a receiver with pilot, control and data signals being sent to the "C/I estimation and LLR computation" processor).

As per **claim 10**, Ling teaches claim 9 wherein the receiver comprises a control signal detector for recovering from the control signal a value for the ratio between the energy per pilot symbol to the energy per data symbol (figures 2 and 4 shows pilot, control and data signals being passed to the "C/I estimation and LLR computation" processor).

As per **claims 11, 17 and 24**, Ling teaches a wireless receiver (C1, L8-12) and A decoder (C2, L50-67 to C3, L52), responsive to the signal modified by the retrieved scale factor, for decoding a received form of the wireless signal (figure 7 shows the decoder responsive to the LLR)

**With further regard to claims 17 and 24**, Ling teaches a demodulator (figure 2, #44). The examiner interprets the figures 5-9 as teaching demodulation process being responsive to retrieved values of the scale factor.

**With further regard to claim 24**, Ling teaches a circuit/processor for computing S/I and LLR (figure 5 and C8, L55-61).

A memory for storing a lookup table (figure 8, #140)

**but is silent on**

lookup table stores an index retrieves a scale factor is a function of a ratio of energy components of the wireless signal.

Holtzman teaches using a stored data curve (or plot) which reads on a lookup table (C11, L50-56).

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that a lookup table is used for storing scale factor, to provide quicker

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means of finding the correct/optimal scale factor (ie. lookup versus finding data on a data curve/plot).

As per **claims 12, 18 and 25**, Ling teaches claim 11/17/24 wherein the signal is a LLR (C2, L50-62).

As per **claims 13 and 19**, Ling teaches claim 11/17 wherein the function is a square root of the ratio between energy components (C14, L4-18 teaches a square root function of  $E_s/E_p$  and "k" is interpreted to be the scale factor of the LLR).

As per **claims 14, 20 and 26**, Ling teaches claim 11/17/24 wherein **but is silent on** wherein the received signal comprises pilot symbols and data symbols and the ratio between energy components is a ratio between transmitted energy per pilot symbol to a transmitted energy per data symbol.

Ling does teach computing energy per data symbol ( $\bar{E}_s$ : C10, L59-60) and pilot symbol energy ( $E_p$ : C14, L14-15).

Sampath and Kumar teach  $\beta$  which can be shown to be a ratio of  $E_p/E_d$  by rearranging the equation on page 2 (eg.  $E_p = \beta E_d$ ).

Jalloul teaches the calculation of a "pilot to data power ratio" (C5, L26-37).

Holtzman teaches calculating a ratio between the energy of the pilot symbols and the traffic/data channel's energy (C9, L44-46).

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that the scale factor is a ratio between energy components, to provide means for correct demodulation (using LLR) based upon a comparison of the energy components of the wireless signal.

As per **claims 15, 21 and 27**, Ling teaches claim 11/17/24 and a lookup table (figure 8, #140) **but is silent on** table values are determined independently of relative strengths and number of multipaths in the received wireless signal.

Ling does teach computing the LLR scaling factor which is independent of relative strengths and number of multipaths since the equation does not show variables for these components (C4, L37-67).

Holtzman teaches using a stored data curve (or plot) which reads on a lookup table (C11, L50-56).

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that the table values are determined independently of relative strengths and number of multipaths in the received wireless signal, to provide means for correct demodulation (using LLR) without requiring dependency on relative strength or number of multipaths.

As per **claims 16 and 23**, Ling teaches claim 11/17 wherein the receiver comprises a control signal detector for recovering from the received signal a value for the ratio between the energy per pilot symbol to the energy per data symbol (figures 2 and 4 shows pilot, control and data signals being passed to the "C/I estimation and LLR computation" processor).

As per **claim 22**, Ling teaches claim 17 further comprising a channel estimator (C3, L63-66).

As per **claim 28**, Ling teaches claim 24 further comprising a processor for determining scale factor as a function of ratio between energy components of the wireless signal (see claim 1), a noise variance in received data symbols (C4, L22-27) **but is silent on** a noise variance in received pilot symbols.

Holtzman teaches calculation of the energy per symbol of the traffic channel and determines the estimate of the noise variance (C9, L60-63). Holtzman also teaches (in step 608 of figure 6) the signal and noise estimator estimates the ratio of the energy of the pilot versus the energy of the symbol AND (in step 610)  $E_p/E_s$  is calculated (C9, L64-67 to C10, L1-7). Holtzman goes on to disclose that other functions and methods may be performed by the signal/noise estimator and control process (C10, L8-16) which reads on calculating a noise variance in received pilot symbols.

It would have been obvious to one skilled in the art at the time of the invention to modify Ling, such that noise variance in received pilot symbols is used, to provide means for incorporating the pilot symbol noise variance into the LLR function.



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**Conclusion**


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:


1. Ramesh US 6,078,626 teaches separable modulation constellations
2. Soliman US 6,201,954 teaches estimated signal strength of received signal
3. Sato US 6,088,324 teaches prediction-based transmission power control
4. Ono US 6,157,687 teaches Rake receiver.
5. Mostafa et al. US 6,381,290 teaches pilot assisted wireless system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 703-306-5426. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Bill Trost can be reached on 703-308-5318. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

SMD   
May 13, 2003

  
WILLIAM TROST  
SUPERVISORY PATENT EXAMINER  
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